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Fig: 1.



Fig: 2.



Fig: 5.

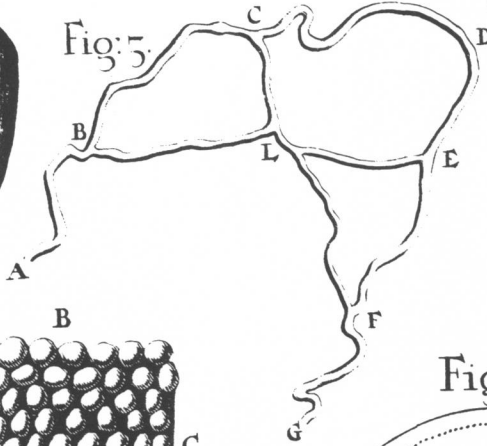


Fig: 4.

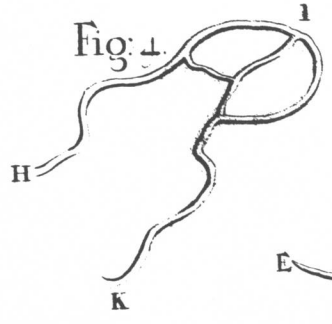


Fig: 6.

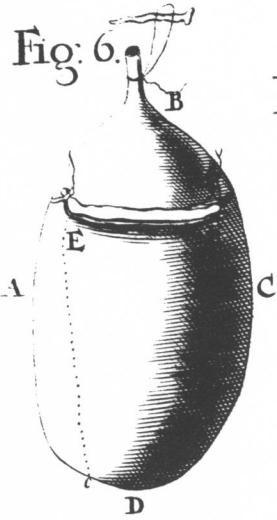


Fig: 7.

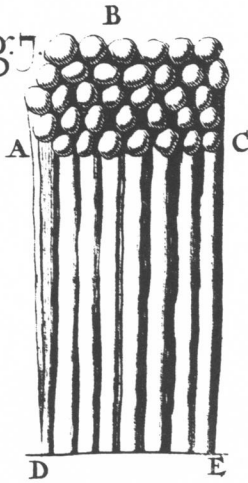


Fig: 8.

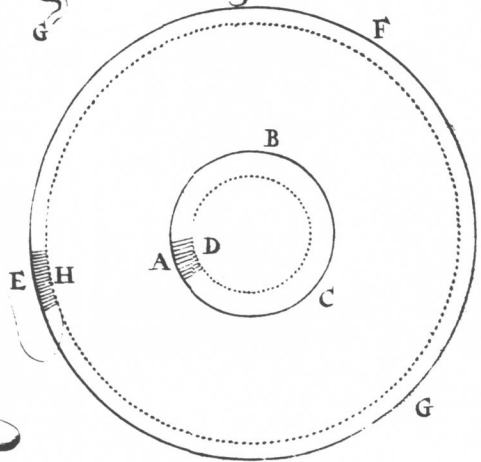


Fig: 9.



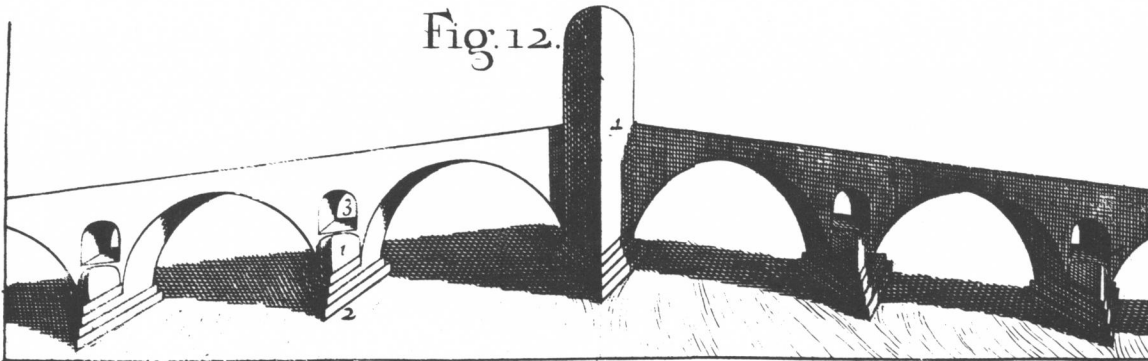
Fig: 10.



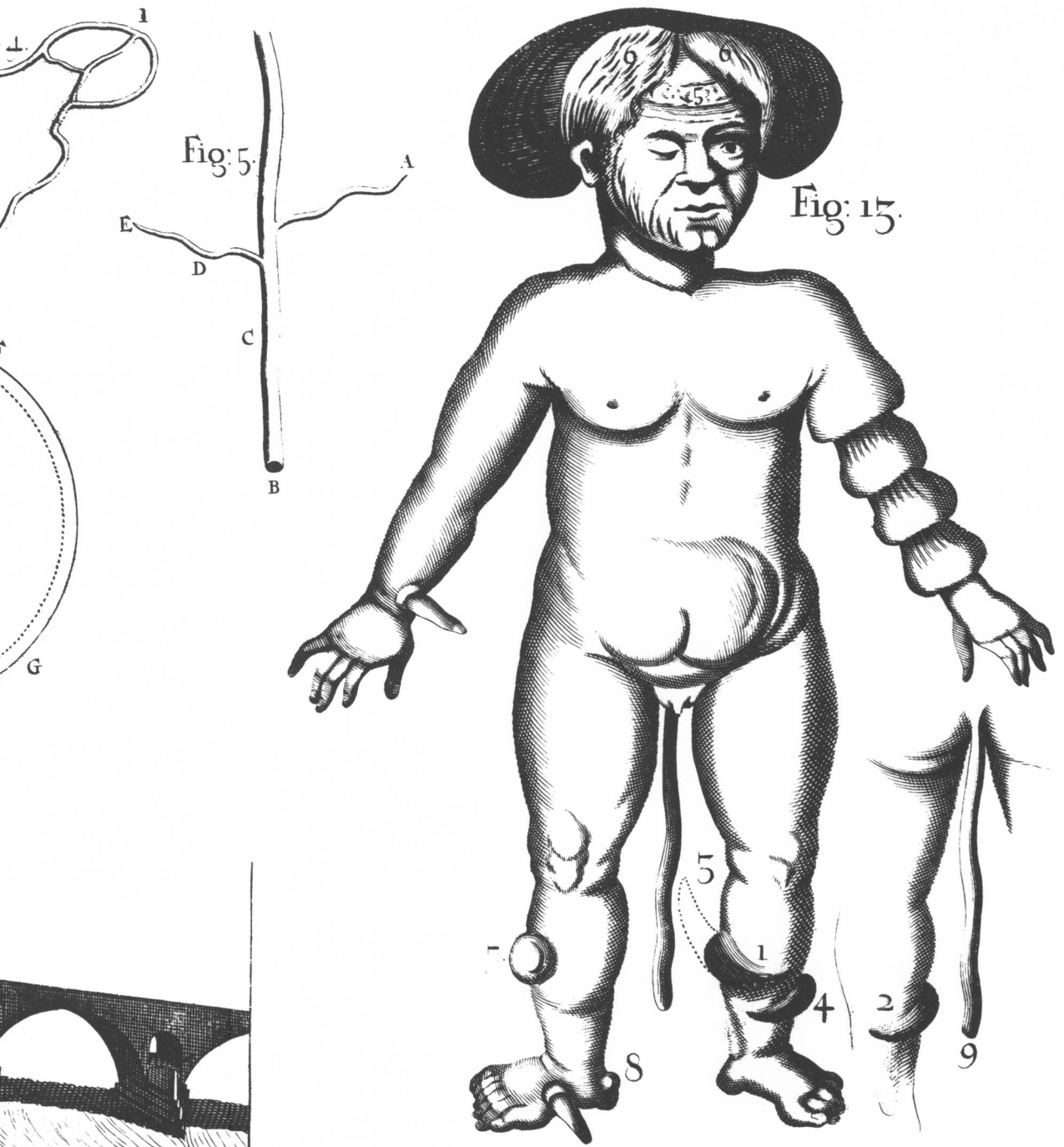
Fig: 11.



Fig: 12.



*MBurghers sculp.*



*An Abstract of a Letter from Mr. A. Leevvenhoeck of Delft, dated Decemb. 28th, 1683. concerning Scales within the mouth, the scaly Child that was shewn, the Anatomy of the Slime within the Guts, and the use thereof.*

**I**N my Letter of the 17th, September 1683. I said that our Skin was covered with Scales. I have since that time examined the *Cuticula* of the inside of the Mouth, and chiefly that of the under Lip; which I find to be covered with *Scales*, greater and broader than those upon the Body; but they are withal thinner. *Fig. 1.* is a *Scale* which I choose out as one of the perfectest and most intire. These *Scales* had more lines or streaks running over them, than the *Scales* had which grew on the outside of the Body, the lines I take to be channels or remainders of vapours breathed thro the Skin. Every *Scale* also had a great many small Globules upon it, very transparent, as is to be seen in the *Figure*.

Another *Scale* lying thereby, had its circumference as *Fig. 2.* But as the *Scales* of our Body, lying over one another, so as to be three deep, are the cause of the skins appearing white, as I have formerly said (for diaphanous Particles laid upon one another, and not too close, make a white; for which reason we see that *Paper*, *Spittle*, *beaten-Glass*, and *Snow* are white): so the *Scales* of our Mouth, (for as much as I can yet find) lying but a little over the sides of one another, suffer the redness of the flesh and blood to appear through them; and for this cause the Lips and Mouth are red.

I have often wondred what should be the cause; that a single hair lying upon the skin caused so great a tickling! But if the Skin be covered with *Scales*, and the outward bark of the hair be very rugged, it will not be strange,

strange, that a hair lying over the edges of one or more *Scales*, should cause a motion in them, which being communicated to the skin, may cause that sensation.

There has been carryed thro this Land to be shew'd, a *Child* about ten years old, whose Body (as they said) was all covered with *Fish Scales*. Having heard very much of this wonder, I went to see it, but found it much different from the Report of it. For there appeared to my naked Eye and Microscope, no part of the Body which I could say was covered with *Fish Scales*, but rather with a thick *Callus*, and more especially within the hands and under the feet; upon some parts of the Body also there were Excrescencies like Ridges of *Warts*.

I desired of those that took care of the *Child*, that I might have one of the Particles, or *Scales* pluckt from the Body; but they refused me, under pretence that the blood would follow it, when I lookt earnestly upon the *Child*, I perceived they were displeased with me; they told me, that the *Scales* fell off four times a year, and others grew in their places: and that daily some of the *Scales* were left in the bed, but they still refused to give me, or sell me any of them; at length in searching carefully about the Room I found a Cluster, which my repeated Observations do confirm to be nothing but natural and ordinary *Scales*, such as bodies use to be covered with. I afterwards put it in water. and let it lye some hours, till the parts would separate with the least touch into a thousand small *Scales*. These were more then ordinarily beset with Globules, and thereby were very like the *Scales* of the Brawn of the inside of the hand. But no otherwise remarkable.

I have been a long time desirous to examine the slimy matter which lines the inside of the Guts, and so much the rather because it is generally esteemed as a superfluous part, and fit to be removed; whereas on the contrary, it appears to me, to be a part instrumental, and necessary

cessary for the uses of the Bowels. I took then this woolly substance, and having cleared it from the Excrement, as much as I could, I found a great number of very thin blood Vessels branched out, and lying so thick together, that the space of half the Diameter of a hair was not void between the branches. Besides the blood-vessels, there were also other vessels that had no distinguishable colour, which I suspected to be Lymphatics or Lacteals: I could not discern any Membrane that encompassed them, but all about them lay a glutinous clear slime, beset with small Globules, which slime and Globules I took to be the Excrements lying upon the Guts, but when I went to scrape gently this slime away, I found that I not only wounded the bloodvessels, but tore away many blood-vessels, and other vessels together.

These blood-vessels do not spread their Branches on all sides, like the blood-vessels in other parts of the body, but as they lye in a Bow, send all their Branches inward, and none outwards: They also lye so close by one another, that I imagine ten thousand of them may be in the space of an inch square; I have described the circumference of one of these vessels in *Fig. 3. A. B. C. D. E. F. G.* which circumference is no greater then to be covered with a sand: The thickness or Diameter is about the 25<sup>th</sup> part of a hair of my head, from the inside many small vessels issuing out doe as it were joyn together, but of these only 4 are specified as in *Fig. 3. B. L. E. and C. L. F.*

*Fig. 4. H. I. K.* is a small vessel, and though I have placed it at some distance from the former, nevertheless it was partly covered by it, as is usual with the rest of them to cover one another: The Bows also lye all the same way, bending towards the passage of the Excrement out of the Guts.

I could not track *H. G.* and *H. K.* any further, by reason

reason that they hid themselves among the other parts of the woolly substances.

From the foregoing Observation, I have been doubtful whether the Arteries and Veins were not in this place joined together, *viz.* whether *A.* were not an Artery, and *G.* a Vein, for among all the Experience that I have had of the blood-vessels I never perceived such a probability of an *Anastomosis*. For in other places the Arteries being variously disseminated for the nourishment of the parts, the veins are so likewise, for the carrying the blood back again into the heart: but in this place the Arteries going no further than the hollow of the Guts, seem to have no other business then to empty themselves into the Veins.

These observations also make me more then ever reject the Opinion, that the Extremities of the Lacteal and Limphatick Vessels have mouths or openings, whereby they receive and take in the Chyle out of the Guts, for I am persuaded that the extremities of the *Lactea* in the Guts are as well covered with their Coat or Membrane in that place, as in other parts of the body, which nevertheless will not hinder the food from passing out of the Guts. For let *Fig. 5.* *A. B. C. D. E.* be the root of a tree, the nourishment that this Root receives out of the Earth, shall pass no easier thro the Extremities *A.* and *E.* than thro any other place about *D.* or *C.* which is of the same bigness. For example, I have seen the small Roots of a Vine an hundred times thinner than an hair of my head, their farther ends *A.* and *E.* take up a place of the one thousand part of the bigness of a sand. Now if a place be no bigger than this, the moisture or nourishment of the Tree, will as well pass thro any part of the Bark or wood of the Root, as thro the places *A. E.* So that a thin capillary Root may as well receive the nourishment at any other place as at the end. And as the Arteries, whose Coats are made up of a threddy substance, can strain the blood thro them,  
( as

( as I have formerly said ) so the nutritive Juice also may pass thro the threddy Coats of the blood, water, and milk-vessels: and in the same manner, the small Branches of the veins may take up substances out of the Bowels, and carry them to the heart.

This will not seem strange when we consider, that if a milk, water, or blood-vessel, be a thousand times less than a hair of ones head, the Coats of them must needs be very thin, and the threds whereof the Coats are made yet thinner. How easy must moisture pass thro the sides of such Vessels; especially when the matter which is to enter into the vessels is thinner than that which is already contained in them.

It has been objected, that while the passage into the Vessels is so open, a quantity of Air and Wind may also get into them. Now that you may see how that the moisture may pass out of the Bowels into the Veins, and the wind not pass, I made this following tryal. I took an Ox Bladder, blew it up, and let it dry as *Figure 6. A. B. C. D.* I then took a piece of a Hog's Gut made clean, about the length of a span, and tied it up at *E.* then I put into it water, till the Gut was about a quarter full: Afterwards I forced in three quarters more of Air, binding it fast at *F.* the Gut then lay upon the Bladder as *E. F.* I then hung them in a Chimney where was made but little fire, and I found that the water in the Gut did not only moisten the Bladder, where it touched it, but run down in two Channels by the side of the bladder; in the space of sixteen hours all the moisture in the Gut was run out, without the least Air, nay the Gut seemed as stiff, as when it was first blown.

Let us now compare the Guts to the Bladder, and the Chyle and Wind in the Guts, to the wind and water in the hogs gut, then shall the Guts let the moisture pass through them, but not the Air.

Among the aforesaid blood-vessels and other vessels  
lying



lying within the Guts, I saw a matter seeming first to consist of Globules. Afterwards it appeared like little Guts within the great Guts: at length it proved to be short threds, whose one end was partly covered with the afore-said vessels, and the other end was fast'ned to a Skin or Membrane, probably the same with that called by the Anatomists the inner-most Coat of the Bowels.

*Fig. 7.* *A. B. C.* are the ends of the threddy substance, otherwise called the slime or woolly substance, which I shall now name the inner-most Muscle of the Bowels, their Appearance (if the blood-vessels be removed) is as in the *Figure*; the threds making the inward Muscle of the bowels, if they be lookt on, on one side are as *A. D. E. C.* the thickness of these threds, is less than a hair of my head: they are very tender, and break upon the least touch: I have sometimes thought that each of these threds consisted of several threds joyned together, or that every thred had a Membrane; for all of them seem to be very close linked together.

This woolly substance (which I have described) I conceive may be of great use; for the threds must be longer, and lye closer together, and have little moisture betwixt them, whilst the Gut is empty and crumpled; but when the gut is full and distended with Victuals, the threds must be shorter, and lye not so close together as when the gut is contracted. By which means, the blood-vessels *Lacteals* and *Lymphaticks* come more easie to receive their liquors into them. For example,

Let us imagine that in the *Fig. 8.* *A. B. C.* is a gut cut across as it is empty and shrunk; that *A. D.* are the threds making the innermost Muscle of the Gut, now if the gut be full and stretched to the wideness of *E. F. G.* the threds *A. D.* will be contracted as *E. H.* not only because they are close compacted together, as they lye among one another, but also because the blood-vessels and other vessels running between them, keep them as

it were bound up : for if they were separated from one another, then would the groffer parts of the Excrements get among them, as often as the Bowels are extended. Now the threds not being crowded so much when the guts are stretched, the Chyle enters more easily into the vessels lying among them, and afterwards upon every Contraction of the guts (because then the threds are squeezed together) is conveyed into the body.

I said before that the threds which make the innermost Muscle of the Bowels, lye with their one end in the hollow of the Bowels, which end is for the most part covered with blood-vessels and other vessels. Their other end is fastened to a Skin or Membrane which probably is taken by Anatomists for the Innermost Coat of the Bowels, as in the line *D. E. Fig. 7.* may be seen. In this Membrane I discovered many Globules of fat, which in some places lay close and crowded together, and therefore appeared in different shapes. In other places lay some fat Particles, at a distance from the rest, these all inclined to an oval shape as *Fig. 9.* In another place a little distant lay ovalish Particles in a right line, as *Fig. 10.* In another place the Particles lay so thick together, that they crowded one another, and appeared as in *Fig. 11.*

*A Letter formerly written to Mr. H. O. containing the Projection of the Threds of Spiders, and Bees breeding in cases made of Leaves, as also, a Viviparous Fly, &c. by Dr. M. Lister.*

I am glad to understand my Letter came safe to your Hands. Give me leave to entertain you now about the Subject of *Insects*, which I see by your last *Phil. transf. Num. 65.* many persons are now curious in.  
And